mixing zone shall be as small as practicable.", and Section 1.4.2.2.B requires, "*The RWQCB shall deny or significantly limit a mixing zone and dilution credits as necessary to protect beneficial uses, meet the conditions of this Policy, or comply with other regulatory requirements.*" A 55:1 dilution credit is available for carbon tetrachloride, which will allow a final AMEL of 8.5 µg/L and a MDEL of 15.8 µg/L; however, the Facility performance level is 2.9 µg/L (i.e., maximum effluent concentration) based on monitoring data from 2012 to 2014. Therefore, the Facility can meet more stringent WQBEL's for carbon tetrachloride than with the full allowance of dilution. For carbon tetrachloride, this Order carries forward the performance-based MDEL of 5.3 µg/L from previous Order R5-2010-0114-04. Additionally, to be consistent with the SIP, which requires establishment of AMEL's for priority pollutants, this Order includes an AMEL of 2.9 µg/L calculated considering effluent variability using the AMEL/MDEL multipliers in Table 2 of the SIP. This represents a mixing zone that is as small as practicable for this Facility and that fully complies with the SIP.

(c) **Chlorodibromomethane and Dichlorobromomethane.** Based on the projected effluent quality upon implementation of ammonia removal, the Facility will not be able to meet end-of-pipe effluent limitations for chlorodibromomethane and dichlorobromomethane. Assimilative capacity is available in the receiving water, and, as discussed above, the human health mixing zone meets the requirements of the SIP and Basin Plan. Therefore, the WQBEL's for chlorodibromomethane and dichlorobromomethane have been developed considering the allowance of human health dilution credits. Section 1.4.2.2 of the SIP requires that, "*A mixing zone shall be as small as practicable.*", and Section 1.4.2.2.B requires, "*The RWQCB shall deny or significantly limit a mixing zone and dilution credits as necessary to protect beneficial uses, meet the conditions of this Policy, or comply with other regulatory requirements.*" Based on the projected effluent quality upon implementation of ammonia removal, the Central Valley Water Board has determined a 55:1 dilution credit is needed for the chlorodibromomethane and dichlorobromomethane. This represents a mixing zone that is as small as practicable for this Facility and that fully complies with the SIP.

(d) **Copper.** Based on existing effluent data between January 2012 and December 2014, and increasing copper concentrations due to water conservation and the drought, it appears that the Facility cannot meet end-of-pipe effluent limitations for copper. Assimilative capacity is available for copper in the receiving water and, as discussed above, the chronic aquatic life mixing zone meets the requirements of the SIP and Basin Plan. As discussed in section IV.C.2.c.iv, the Central Valley Water Board has denied the allowance of an acute aquatic life mixing zone in this Order. Therefore, the WQBEL's for copper have been developed considering the allowance of chronic aquatic life dilution credits. For copper the dynamic modeling approach described in Section IV.C.4.f has not been used to calculate the WQBELs. Instead, the Discharger's model was used to determine the dilution factor at the edge of the 60 foot chronic aquatic life mixing zone and the long-term average was calculated using the SIP's steady-state modeling approach. Considering a chronic aquatic life mixing zone with a dilution factor of 2.45, and no mixing zone for acute

criteria, the WQBELs for copper are an AMEL of 8.6 µg/L and MDEL of 12 µg/L. Based on Facility performance and due to concerns that effluent copper concentrations are increasing due to recent drought conditions and water conservation efforts, the mixing zone for copper is as small as practicable for this Facility and fully complies with the SIP.

(e) **Cyanide.** Based on existing effluent data between January 2012 and December 2014, it appears that the Facility cannot meet end-of-pipe effluent limitations for cyanide. Assimilative capacity is available for cyanide in the receiving water and, as discussed above, the chronic aquatic life mixing zone meets the requirements of the SIP and Basin Plan. As discussed in section IV.C.2.c.iv, the Central Valley Water Board has denied the allowance of an acute aquatic life mixing zone in this Order. Therefore, the WQBEL's for cyanide have been developed considering the allowance of chronic aquatic life dilution credits. Considering a chronic aquatic life mixing zone, the WQBELs for cyanide are an AMEL of 13 µg/L and MDEL of 22 µg/L. Based on Facility performance and due to concerns that effluent cyanide concentrations are increasing due to recent drought conditions and water conservation efforts, the mixing zone for cyanide is as small as practicable for this Facility and fully complies with the SIP.

viii. **Regulatory Compliance for Dilution Credits and Mixing Zones.** To fully comply with all applicable laws, regulations and policies of the State, Central Valley Water Board approved mixing zones and the associated dilution credits based on the following:

(a) Mixing zones are allowed under the SIP provided all elements contained in Section 1.4.2.2 are met. Based on the mixing zone study conducted by the Discharger, the Central Valley Water Board has determined that these factors are met.

Section 1.4.2.2.of the SIP requires mixing zones to be as small as practicable. Based on the mixing zone study conducted by the Discharger, the Central Valley Water Board has determined the mixing zones are as small as practicable.

(b) The allowance of mixing zones in this Order complies with California's State Anti-Degradation Policy, State Water Board Resolution 68-16, which incorporates the federal antidegradation regulations and requires that existing quality of waters be maintained unless degradation is justified based on specific findings. Item 2 of Resolution 68-16 states:

> *"Any activity which produces or may produce a waste or increased volume or concentration of waste and which dischargers or proposed to discharge to existing high quality waters will be required to meet waste discharge requirements which will result in the best practicable treatment or control of the discharge necessary to assure that (a) a pollution or nuisance will not occur and (b) the highest water quality consistent with maximum benefit to the people of the State will be maintained."*

The water quality-based effluent limitations in this Order for bis (2-ethylhexyl) phthalate, carbon tetrachloride, copper, cyanide, chlorodibromomethane, and dichlorobromomethane will result in the

Discharger implementing best practicable treatment or control (BPTC) of the discharge necessary to assure that pollution or nuisance will not occur and the highest water quality consistent with maximum benefit to the people of the State will be maintained.

(c) In accordance with Section 1.4.2.2 of the SIP, the Board has determined the mixing zones are as small as practicable, will not compromise the integrity of the entire water body, restrict the passage of aquatic life, dominate the water body or overlap existing mixing zones from different outfalls. The mixing zones are small relative to the large size of the receiving water, are not at or near a drinking water intake, and do not overlap a mixing zone from a different outfall.

(d) The Central Valley Water Board has determined allowing such mixing zones will not cause acutely toxic conditions to aquatic life passing through the mixing zone.

(e) The Central Valley Water Board has determined the discharge will not adversely impact biologically sensitive or critical habitats, including, but not limited to, habitat of species listed under the federal or State endangered species laws, because the mixing zones are relatively small and acutely toxic conditions will not occur in the mixing zone. The discharge will not produce undesirable or nuisance aquatic life, result in floating debris, oil, or scum, produce objectionable odor, taste, or turbidity, cause objectionable bottom deposits, or cause nuisance, because the Order establishes end-of-pipe effluent limitations (e.g., for BOD_5 and TSS) and discharge prohibitions to prevent these conditions from occurring.

(f) As required by the SIP, in determining the extent of or whether to allow mixing zones and dilution credits, the Central Valley Water Board has considered the presence of pollutants in the discharge that are carcinogenic, mutagenic, teratogenic, persistent, bioaccumulative, or attractive to aquatic organisms, and concluded that the allowance of the mixing zones and dilution credits are adequately protective of the beneficial uses of the receiving water.

(g) The Central Valley Water Board has determined the mixing zones comply with the SIP for priority pollutants.

(h) The Central Valley Water Board has determined the mixing zones comply with the Basin Plan for non-priority pollutants. The Basin Plan requires a mixing zone not adversely impact beneficial uses. Beneficial uses will not be adversely affected for the same reasons discussed above. In determining the size of the mixing zone, the Central Valley Water Board has considered the procedures and guidelines in Section 5.1 of U.S. EPA's *Water Quality Standards Handbook*, 2nd Edition (updated July 2007) and Section 2.2.2 of the TSD. The SIP incorporates the same guidelines.

(i) Section 1.4.2.2B of the SIP, in part states, *"The RWQCB shall deny or significantly limit a mixing zone and dilution credits as necessary to protect beneficial uses, meet the conditions of this Policy, or comply with other regulatory requirements."* The Central Valley Water Board has determined full allowance of dilution is not needed or necessary for the Discharger to achieve compliance with effluent limitations for bis (2-

ethylhexyl) phthalate and carbon tetrachloride. Therefore, the effluent limitations established in the Order for bis (2-ethylhexyl) phthalate and carbon tetrachloride have been adjusted by reduced dilution credits developed based on performance of the current wastewater treatment capabilities.

The Central Valley Water Board determined the effluent limitations required by this Order for bis (2-ethylhexyl) phthalate and carbon tetrachloride comply with the State Anti-Degradation Policy because the Order will result in the Discharger implementing BPTC of the discharge necessary to assure that pollution or nuisance will not occur and the highest water quality consistent with maximum benefit to the people of the State will be maintained. The Central Valley Water Board also determined the Discharger will be in immediate compliance with the effluent limitations. The effluent limitations for bis (2-ethylhexyl) phthalate and carbon tetrachloride that have been adjusted using reduced dilution credits is consistent with Section 1.4.2.2B of the SIP that requires the Central Valley Water Board deny or significantly limit a mixing zone and dilution credits as necessary to comply with other regulatory requirements.

d. **Conversion Factors.** The CTR contains aquatic life criteria for arsenic, cadmium, chromium III, chromium VI, copper, lead, nickel, silver, and zinc which are presented in dissolved concentrations. U.S. EPA recommends conversion factors to translate dissolved concentrations to total concentrations. The default U.S. EPA conversion factors contained in Appendix 3 of the SIP were used to convert the applicable dissolved criteria to total recoverable criteria.

e. **Hardness-Dependent CTR Metals Criteria.** The CTR and the NTR contain water quality criteria for seven metals that vary as a function of hardness. The lower the hardness the lower the water quality criteria. The metals with hardness-dependent criteria include cadmium, copper, chromium III, lead, nickel, silver, and zinc.

This Order has established the criteria for hardness-dependent metals based on the hardness of the receiving water (actual ambient hardness) as required by the SIP[1], the CTR[2]. The SIP and the CTR require the use of "receiving water" or "actual ambient" hardness, respectively, to determine effluent limitations for these metals. The CTR requires that the hardness values used shall be consistent with the design discharge conditions for design flows and mixing zones[3]. Where design flows for aquatic life criteria include the lowest 1-day flow with an average reoccurrence frequency of once in 10 years (1Q10) and the lowest average 7 consecutive day flow with an average reoccurrence frequency of once in 10 years (7Q10)[4]. This section of the CTR also indicates that the design conditions should be established such that the appropriate criteria are not exceeded more than once in a 3 year period on average[5]. The CTR requires that when mixing zones are allowed, the CTR criteria apply at the edge of the mixing zone, otherwise the criteria apply

[1] The SIP does not address how to determine the hardness for application to the equations for the protection of aquatic life when using hardness-dependent metals criteria. It simply states, in Section 1.2, that the criteria shall be properly adjusted for hardness using the hardness of the receiving water.
[2] The CTR requires that, for waters with a hardness of 400 mg/L (as $CaCO_3$), or less, the actual ambient hardness of the surface water must be used (40 C.F.R. § 131.38(c)(4)).
[3] 40 C.F.R. §131.3(c)(4)(ii)
[4] 40 C.F.R. §131.38(c)(2)(iii) Table 4
[5] 40 C.F.R. §131.38(c)(2)(iii) Table 4, notes 1 and 2

throughout the water body, including at the point of discharge[1]. The CTR does not define whether the term "ambient," as applied in the regulations, necessarily requires the consideration of upstream as opposed to downstream hardness conditions.

i. **Summary Findings**

Given the high variability in ambient hardness values (see Figure F-2 below), there is no single hardness value that describes the ambient receiving water for all possible scenarios (e.g., minimum, maximum). Because of this variability, staff has determined that, based on the ambient hardness concentrations measured in the receiving water, the Central Valley Water Board has discretion to select ambient hardness values within the range of 34 mg/L (minimum) up to 100 mg/L (maximum). Staff recommends that the Board use the ambient hardness values shown in Table F-7 for the following reasons.

(a) Using the ambient receiving water hardness values shown in Table F-7 will result in criteria and effluent limitations that ensure protection of beneficial uses under all ambient receiving water conditions.

(b) The Water Code mandates that the Central Valley Water Board establish permit terms that will ensure the reasonable protection of beneficial uses. In this case, using the lowest measured ambient hardness to calculate effluent limitations is not reasonable, because it would result in overly conservative limits that will impart substantial costs to the Discharger and ratepayers without providing any additional protection of beneficial uses. In compliance with applicable state and federal regulatory requirements, Board staff has instead used the ambient hardness values shown in Table F-7 to calculate the proposed effluent limitations for hardness-dependent metals. The proposed effluent limitations will still be fully protective of all beneficial uses under all flow conditions.

(c) Using an ambient hardness that is higher than the minimum of 34 mg/L will result in a limit that may allow increased metals to be discharged to the river, but such discharge is allowed under the antidegradation policy (State Water Board Resolution 68-16). The Board finds that this degradation is consistent with the antidegradation policy (see antidegradation findings in Section IV.D.4 of the Fact Sheet). The Antidegradation policy requires the Discharger to meet waste discharge requirements which will result in the best practicable treatment or control of the discharge necessary to assure that: a) a pollution or nuisance will not occur, and b) the highest water quality consistent with maximum benefit to the people of the State will be maintained.

(d) Using the ambient hardness values shown in Table F-7 is fully consistent with the CTR and SIP's requirements for developing metals criteria.

[1] 40 C.F.R. §131.38(c)(2)(i)

Table F-7. Summary of CTR Criteria for Hardness-dependent Metals

CTR Metals	Ambient Hardness (mg/L)[2,3]	CTR Criteria (µg/L, total recoverable)[1]	
		acute	chronic
Copper	84	12	8.0
Chromium III	84	1,500	180
Cadmium	78 (acute) 84 (chronic)	3.4	2.1
Lead	78	60	2.3
Nickel	84	400	45
Silver	72	2.3	--
Zinc	84	100	100

1 Metal criteria rounded to two significant figures in accordance with the CTR (40 C.F.R. §131.38(b)(2)).

2 The ambient hardness values in this table represent actual observed receiving water hardness measurements from the dataset shown in Figure F-2.

3 The CTR's hardness-dependent metals criteria equations vary depending on the metal, which results in difference in the range of ambient hardness values that may be used to develop effluent limitations that are protective of beneficial uses and comply with CTR criteria for all ambient flow conditions.

ii. **Background**

The State Water Board provided direction regarding the selection of hardness in two precedential water quality orders; WQO 2008-0008 for the City of Davis Wastewater Treatment Plant (Davis Order) and WQO 2004-0013 for the Yuba City Wastewater Treatment Plant (Yuba City Order). The State Water Board recognized that the SIP and the CTR do not discuss the manner in which hardness is to be ascertained, thus regional water boards have considerable discretion in determining ambient hardness so long as the selected value is protective of water quality criteria under the given flow conditions. (Davis Order, p.10). The State Water Board explained that it is necessary that, "*The [hardness] value selected should provide protection for all times of discharge under varying hardness conditions.*" (Yuba City Order, p. 8). The Davis Order also provides that, "*Regardless of the hardness used, the resulting limits must always be protective of water quality criteria under all flow conditions.*" (Davis Order, p. 11)

The equation describing the total recoverable regulatory criterion, as established in the CTR, is as follows:

$$\text{CTR Criterion} = \text{WER} \times (e^{m[\ln(H)]+b}) \qquad \text{(Equation 1)}$$

Where:

H = ambient hardness (as $CaCO_3$)[1]

WER = water-effect ratio

m, b = metal- and criterion-specific constants

The direction in the CTR regarding hardness selection is that it must be based on ambient hardness and consistent with design discharge conditions for

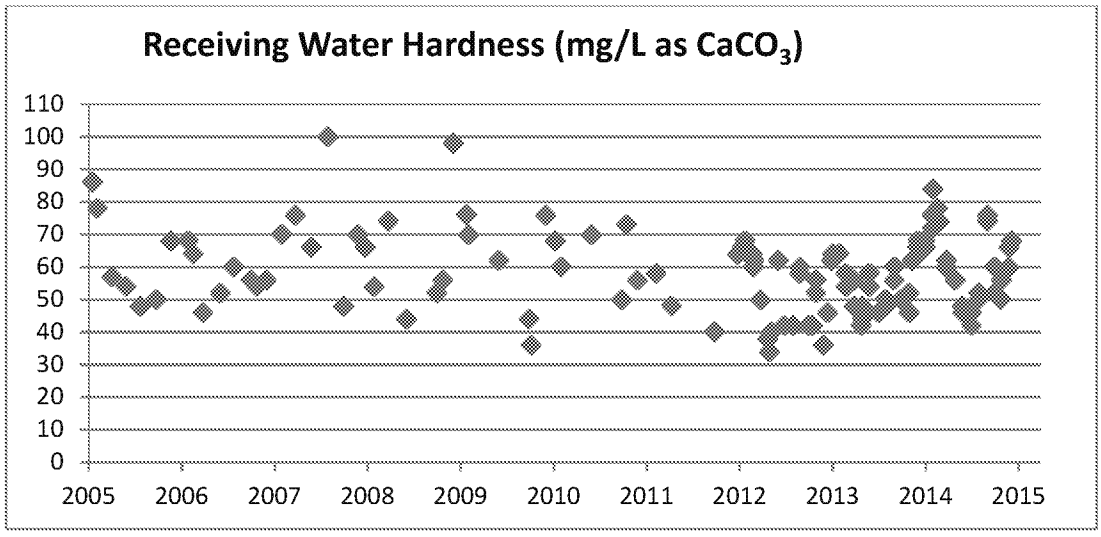
[1] For this discussion, all hardness values are expressed in mg/L as $CaCO_3$.

design flows and mixing zones. Consistent with design discharge conditions and design flows means that the selected "design" hardness must result in effluent limitations under design discharge conditions that do not result in more than one exceedance of the applicable criteria in a 3 year period[1]. Where design flows for aquatic life criteria include the lowest one-day flow with an average reoccurrence frequency of once in ten years (1Q10) and the lowest average 7 consecutive day flow with an average reoccurrence frequency of once in ten years (7Q10). The 1Q10 and 7Q10 Sacramento River flows are 5,060 cfs and 5,846 cfs, respectively.

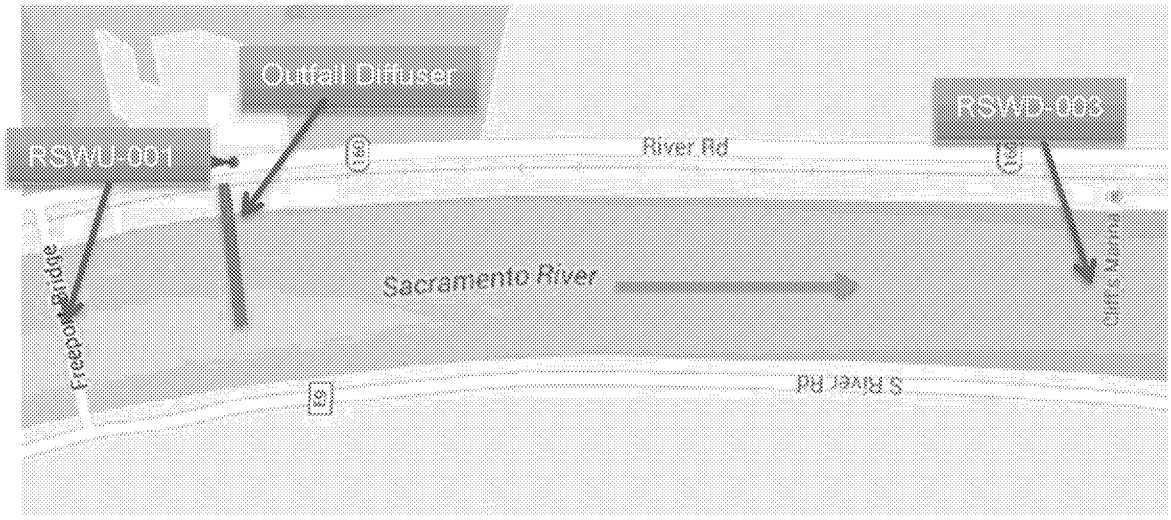
iii. **Ambient Conditions**

The upstream receiving water hardness at Monitoring Location RSWU-001 (Sacramento River at Freeport Bridge) varied from 34 mg/L to 100 mg/L, based on 107 samples collected between January 2005 and December 2014; the downstream receiving water hardness at Monitoring Location RSWD-003 (Sacramento River at Cliff's Marina) varied from 34 mg/L to 76 mg/L, based on 38 samples collected between January 2012 and December 2014. The Board has found that downstream hardness must be considered in developing metals criteria because it best represents the ambient receiving water downstream of the facility. In the location of the discharge, the receiving water periodically reverses direction, so both upstream and downstream hardness have been used in this analysis. Figure F-2 below shows the observed hardness data measured in the receiving water.

Figure F-2. Observed Receiving Water Hardness Concentrations from January 2005 to December 2014 (Upstream and Downstream Values)



[1] 40 C.F.R. §131.38(c)(2)(iii) Table 4, notes 1 and 2



In this analysis, the entire range of ambient hardness concentrations shown in Figure F-2 were considered to determine the appropriate ambient hardness to calculate the CTR criteria and effluent limitations that are protective under all discharge conditions.

iv. **Approach to Derivation of Criteria**

As shown above, ambient hardness varies substantially. Because of the variation, there is no single hardness value that describes the ambient receiving water for all possible scenarios (e.g., minimum, maximum, mid-point). While the hardness selected must be hardness of the ambient receiving water, selection of an ambient receiving water hardness that is too high would result in effluent limitations that do not protect beneficial uses. Also, the use of minimum ambient hardness would result in criteria that are protective of beneficial uses, but such criteria may not be representative or fair and reasonable considering the wide range of ambient conditions.

Reasonable worst-case ambient conditions. To determine whether a selected ambient hardness value results in fair and reasonable effluent limitations that are fully protective while complying with federal regulations and state policy, staff have conducted an analysis considering varying ambient hardness and flow conditions. To do this, the Board has ensured that the receiving water hardness and criteria selected for effluent limitations are protective under "reasonable-worst case ambient conditions." These conditions represent the receiving water conditions under which derived effluent limitations would ensure protection of beneficial uses under all ambient flow and hardness conditions.

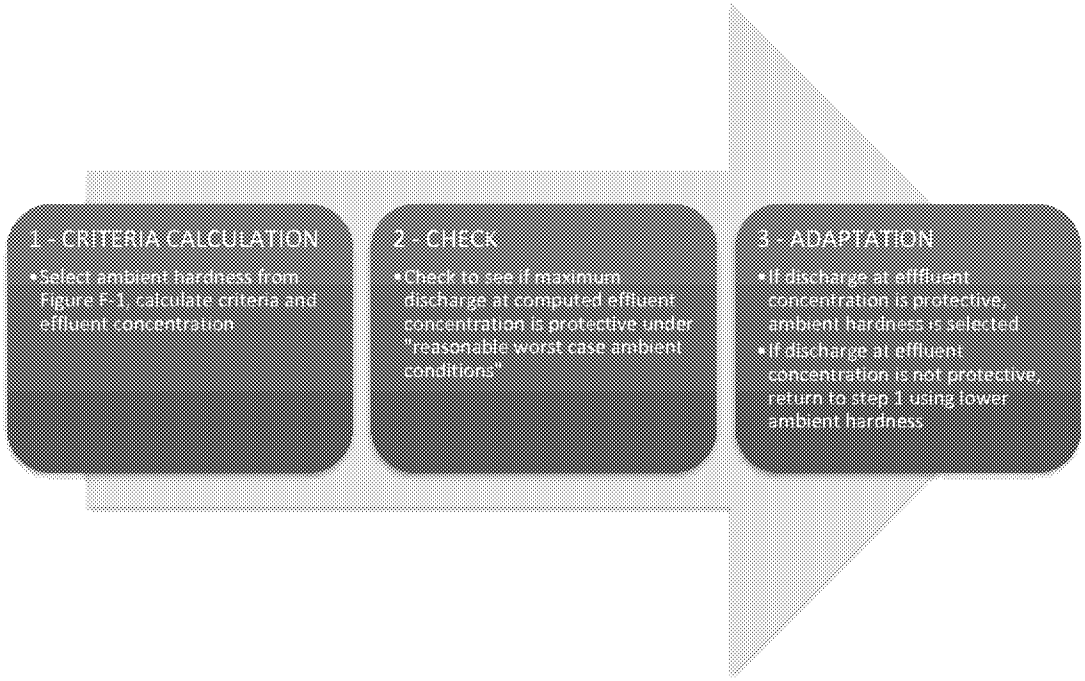
Reasonable worst-case ambient conditions:

- "Low receiving water flow." CTR design discharge conditions (1Q10 and 7Q10) have been selected to represent reasonable worst case receiving water flow conditions.
- "High receiving water flow (maximum receiving water flow)." This additional flow condition has been selected consistent with the Davis Order, which required that the hardness selected be protective of water quality criteria under all flow conditions.

- "Low receiving water hardness." The minimum receiving water hardness condition of 34 mg/L was selected to represent the reasonable worst case receiving water hardness.
- "Upstream ambient metal concentration at criteria." This condition assumes that the metal concentration in the upstream receiving water is equal to CTR criteria (upstream of the facility's discharge).

Iterative approach. An iterative analysis has been used to select the ambient hardness to calculate the criteria that will result in effluent limitations that protect beneficial uses under all flow conditions.

The iterative approach is summarized in the following algorithm and described below in more detail.



1. CRITERIA CALCULATION. CTR criteria are calculated based on actual measured ambient hardness sample results, starting with the maximum observed ambient hardness of 100 mg/L. Effluent concentrations are calculated.
2. CHECK. Using U.S. EPA's simple mass balance equation[1], maximum discharge at the computed effluent concentration is assumed. Resultant downstream metal concentration is then compared with downstream calculated CTR criteria under reasonable worst-case ambient conditions.
3. ADAPT. If step 2 results in:
   (A) receiving water metal concentration that complies with CTR criteria under reasonable worst-case ambient conditions, then the hardness value is selected.
   (B) receiving water metal concentration greater than CTR criteria, then return to bullet 1, selecting a lower ambient hardness value.

[1] U.S. EPA NPDES Permit Writers' Handbook (EPA 833-K-10-001 September 2010, pg. 6-24)

The CTR's hardness dependent metals criteria equation contains metal-specific constants, so the criteria vary differently depending on the metal. Therefore, steps 1 through 3 must be repeated separately for each metal until ambient hardness values are determined that will result in criteria and effluent limitations that comply with the CTR and protect beneficial uses for all metals. This is the reason for the differences in the selected ambient hardness values shown in Table F-7 above.

v. **Results of Iterative Analysis**

The above iterative analysis for each CTR hardness-dependent metal results in the selected ambient hardness values shown in Table F-7, above. Using these hardness values to calculate criteria, which are actual sample results collected in the receiving water, will result in effluent limitations that are protective under all ambient flow conditions. Copper and silver are used as examples below to illustrate the results of the analysis. Tables F-8 and F-9 below summarize the numeric results of the three step iterative approach for copper and silver. As shown in the example tables, ambient hardness values of 84 mg/L (copper) and 72 mg/L (silver) are used to derive criteria and effluent limitations. Then under the "check" step, worst-case ambient receiving water conditions are used to test whether discharge at the computed effluent limitations results in compliance with CTR criteria and protection of beneficial uses.

The results of the above analysis, summarized in the tables below, show that the ambient hardness values selected using the three-step iterative process results in protective effluent limitations that achieve CTR criteria under all flow conditions. Tables F-8 and F-9 below summarize the critical flow conditions. However, the analysis evaluated all flow conditions to ensure compliance with the CTR criteria at all times.

Table F-8. Verification of CTR Compliance for Copper

Receiving water hardness used to compute effluent limitations				**84 mg/L**
Effluent Concentration Allowance for Copper				**8.0 µg/L[2,3]**
Effluent Limitations for Copper				**7.4/10 µg/L[2,3]**
	Downstream Ambient Concentrations Under Worst-Case Ambient Receiving Water Conditions			**Complies with CTR Criteria?**
	Hardness	**CTR Criteria (µg/L)**	**Ambient Copper Concentration[1] (µg/L)**	
1Q10	36.7	4.0	3.9	**Yes**
7Q10	36.4	3.9	3.9	**Yes**
Max receiving water flow	34.2	3.7	3.7	**Yes**

1 This concentration is derived using worst-case ambient conditions. These conservative assumptions will ensure that the receiving water always complies with CTR criteria.

2 The chronic effluent concentration allowance is shown in this table without the allowance for dilution. An average monthly effluent limitation (AMEL) of 7.4 µg/L and maximum daily effluent limitation (MDEL) of 10 µg/L are calculated based on the chronic effluent concentration allowance, without the allowance for dilution, in accordance with section 1.4 of the SIP.

3 As discussed in Section IV.C.2.c, above, this Order allows a chronic aquatic life mixing zone for copper. Therefore, per 40 C.F.R. §131.38(c)(2)(i) the CTR chronic criteria for copper apply at the edge of the approved 60-foot chronic aquatic life mixing zone. In

accordance with section 1.4 of the SIP, a chronic dilution factor of 2.45 was applied to the applicable CTR chronic criterion shown in Table F-7 to calculate the WQBELs for copper. Considering no dilution for the CTR acute criterion, this Order includes an AMEL of 8.6 µg/L and MDEL of 12 µg/L for copper (see Attachment H for calculation of WQBELs).

Table F-9. Verification of CTR Compliance for Silver

Receiving water hardness used to compute effluent limitations				**72 mg/L**
Effluent Concentration Allowance for Silver				**2.3 µg/L**
Effluent Limitations for Silver				**N/A[2]**
	Downstream Ambient Concentrations Under Worst-Case Ambient Receiving Water Conditions			**Complies with CTR Criteria?**
	Hardness	**CTR Criteria (µg/L)**	**Ambient Silver Concentration[1] (µg/L)**	
1Q10	36.7	0.7	0.7	**Yes**
7Q10	36.4	0.7	0.7	**Yes**
Max receiving water flow	34.2	0.6	0.6	**Yes**

1 This concentration is derived using worst-case ambient conditions. These conservative assumptions will ensure that the receiving water always complies with CTR criteria.
2 There is no effluent limitation for silver as it does not demonstrate reasonable potential.

3. Determining the Need for WQBEL's

a. **Constituents with No Reasonable Potential.** WQBEL's are not included in this Order for constituents that do not demonstrate reasonable potential (e.g., constituents were not detected in the effluent or receiving water); however, monitoring for those pollutants is established in this Order as required by the SIP. If the results of effluent monitoring demonstrate reasonable potential, this Order may be reopened and modified by adding an appropriate effluent limitation.

Most constituents with no reasonable potential are not discussed in this Order. However, the following constituents were found to have no reasonable potential after assessment of the data:

i. **Aluminum**

Aluminum is the third most abundant element in the earth's crust and is ubiquitous in both soils and aquatic sediments. When mobilized in surface waters, aluminum has been shown to be toxic to various fish species. However, the potential for aluminum toxicity in surface waters is directly related to the chemical form of aluminum present, and the chemical form is highly dependent on water quality characteristics that ultimately determine the mechanism of aluminum toxicity. Surface water characteristics, including pH, temperature, colloidal material, fluoride and sulfate concentrations, and total organic carbon, all influence aluminum speciation and its subsequent bioavailability to aquatic life. Calcium [hardness] concentrations in surface water may also reduce aluminum toxicity by competing with monomeric aluminum (Al^{3+}) binding to negatively charged fish gills.

(a) **WQO.** DDW has established Secondary Maximum Contaminant Levels (MCL's) to assist public drinking water systems in managing their drinking water for aesthetic conditions such as taste, color, and odor. The Secondary MCL for aluminum is 200 µg/L for protection of the MUN

beneficial use. Title 22 requires compliance with Secondary MCL's on an annual average basis.

The Code of Federal Regulations promulgated criteria for priority toxic pollutants for California's surface waters as part of section 131.38 Establishment of Numeric Criteria for Priority Toxic Pollutants for the State of California (California Toxics Rule or CTR), including metals criteria. However, aluminum criteria were not promulgated as part of the CTR. Absent numeric aquatic life criteria for aluminum, WQBEL's in the Central Valley Region's NPDES permits are based on the Basin Plans' narrative toxicity objective. The Basin Plans' Policy for Application of Water Quality Objectives requires the Central Valley Water Board to consider, "*on a case-by-case basis, direct evidence of beneficial use impacts, all material and relevant information submitted by the discharger and other interested parties, and relevant numerical criteria and guidelines developed and/or published by other agencies and organizations. In considering such criteria, the Board evaluates whether the specific numerical criteria which are available through these sources and through other information supplied to the Board, are relevant and appropriate to the situation at hand and, therefore, should be used in determining compliance with the narrative objective*." Relevant information includes, but is not limited to (1) U.S. EPA Ambient Water Quality Criteria (NAWQC) and subsequent Correction, (2) site-specific conditions of the Sacramento River, the receiving water, and (3) site-specific aluminum studies conducted by dischargers within the Central Valley Region. (Basin Plan, p. IV.-17.00; see also, 40 C.F.R. §122.44(d)(vi).)

U.S. EPA NAWQC. U.S. EPA recommended the NAWQC aluminum acute criterion at 750 µg/L based on test waters with a pH of 6.5 to 9.0. U.S. EPA also recommended the NAWQC aluminum chronic criterion at 87 µg/L based upon the following two toxicity tests. All test waters contained hardness at 12 mg/L as $CaCO_3$.

(1) Acute toxicity tests at various aluminum doses were conducted in various acidic waters (pH 6.0 – 6.5) on 159- and 160-day old striped bass. The 159-day old striped bass showed no mortality in waters with pH at 6.5 and an aluminum dose at 390 µg/L, and the 160-day old striped bass showed 58% mortality at a dose of 174.4 µg/L in same pH waters. However, the 160-day old striped bass showed 98% mortality at an aluminum dose of 87.2 µg/L in waters with pH at 6.0, which is U.S. EPA's basis for the 87 µg/L chronic criterion. The varied results draw into question this study and the applicability of the NAWQC chronic criterion of 87 µg/L.

(2) Chronic toxicity effects on 60-day old brook trout were evaluated in circumneutral pH waters (6.5-6.9 pH) in five cells at various aluminum doses (4, 57, 88, 169, and 350 µg/L). Chronic evaluation started upon hatching of eyed eggs of brook trout, and their weight and length were measure after 45 days and 60 days. The 60-day old brook trout showed 24% weight loss at 169 µg/L of aluminum and 4% weight loss at 88 µg/L of aluminum, which is the basis for U.S. EPA's chronic criteria. Though this test study shows chronic toxic effects of 4% reduction in weight after exposure for 60-days, the chronic

criterion is based on 4-day exposure; so again, the applicability of the NAWQC chronic criterion of 87 µg/L is questionable.

Site-specific Conditions. U.S. EPA advises that a water effects ratio may be more appropriate to better reflect the actual toxicity of aluminum to aquatic organisms when the pH and hardness conditions of the receiving water are not similar to that of the test conditions.[1] Effluent and Sacramento River monitoring data indicate that the pH and hardness values are not similar to the low pH and hardness conditions under which the chronic criterion for aluminum was developed, as shown in the table below, and therefore, the Central Valley Water Board does not expect aluminum to be as toxic in the Sacramento River as in the previously described toxicity tests. The pH of the Sacramento River, the receiving water, ranged from 6.6 to 8.4 with a median of 7.6 based on 170 monitoring results obtained between January 2012 and December 2014. These water conditions typically are circumneutral pH where aluminum is predominately in the form of $Al(OH)_3$ and non-toxic to aquatic life. The hardness of the Sacramento River ranged from 34 mg/L to 100 mg/L, based on 107 samples between January 2005 and December 2014, which is above the conditions, and thus less toxic, than the tests used to develop the chronic criterion.

Parameter	Units	Test Conditions for Applicability of Chronic Criterion	Effluent	Receiving Water
pH	standard units	6.0 – 6.5	6.2 – 7.0	6.6 – 8.4
Hardness, Total (as $CaCO_3$)	mg/L	12	86 – 140	34 – 100
Aluminum, Total Recoverable	µg/L	87.2 - 390	5.7 – 38	78 – 900

Local Environmental Conditions and Studies. Twenty-one site-specific aluminum toxicity tests have been conducted within the Central Valley Region. The pH and hardness of the Sacramento River are similar, as shown in the table below, and thus the results of these site-specific aluminum toxicity tests are relevant and appropriate for the Sacramento River. As shown in the following table, all EC_{50}[2] toxicity study result values are at concentrations of aluminum above 5,000 µg/L. Thus, the toxic effects of aluminum in these surface waters and in the Sacramento River is less toxic (or less reactive) to aquatic species then demonstrated in the toxicity tests that U.S. EPA used for the basis of establishing the chronic criterion of 87 µg/L. This new information, and review of the toxicity tests U.S. EPA used to establish the chronic criterion, indicates that 87 µg/L is overly stringent and not applicable to the Sacramento River.

[1] "*The value of 87 micro-g/L is based on a toxicity test with striped bass in water with pH = 6.5-6.6 and hardness < 10 mg/L. Data in [a 1994 Study] indicate that aluminum is substantially less toxic at higher pH and hardness, but the effects of pH and hardness are not well quantified at this time.*" U.S. EPA 1999 NAWQC Correction, Footnote L

[2] The effect concentration is a point estimate of the toxicant concentration that would cause an observable adverse effect (e.g. death, immobilization, or serious incapacitation) in a given percent of the test organisms, calculated from a continuous model (e.g. Probit Model). EC_{50} is a point estimate of the toxicant concentration that would cause an observable adverse effect in 50 percent of the test organisms. The EC_{50} is used in toxicity testing to determine the appropriate chronic criterion.

Central Valley Region Site-Specific Aluminum Toxicity Data

Discharger	Test Waters	Hardness Value	Total Aluminum EC_{50} Value	pH	WER
***Oncorhynchus mykiss* (rainbow trout)**					
Manteca	Surface Water/Effluent	124	>8600	9.14	N/C
Auburn	Surface Water	16	>16500	7.44	N/C
Modesto	Surface Water/Effluent	120/156	>34250	8.96	>229
Yuba City	Surface Water/Effluent	114/164[1]	>8000	7.60/7.46	>53.5
***Ceriodaphnia dubia* (water flea)**					
Auburn	Effluent	99	>5270	7.44	>19.3
	Surface Water	16	>5160	7.44	>12.4
Manteca	Surface Water/Effluent	124	>8800	9.14	N/C
	Effluent	117	>8700	7.21	>27.8
	Surface Water	57	7823	7.58	25.0
	Effluent	139	>9500	7.97	>21.2
	Surface Water	104	>11000	8.28	>24.5
	Effluent	128	>9700	7.78	>25.0
	Surface Water	85	>9450	7.85	>25.7
	Effluent	106	>11900	7.66	>15.3
	Surface Water	146	>10650	7.81	>13.7
Modesto	Surface Water/Effluent	120/156	31604	8.96	211
Yuba City	Surface Water/Effluent	114/164[1]	>8000	7.60/7.46	>53.5
Placer County (SMD 1)	Effluent	150	>5000	7.4 – 8.7	>13.7
***Daphnia magna* (water flea)**					
Manteca	Surface Water/Effluent	124	>8350	9.14	N/C
Modesto	Surface Water/Effluent	120/156	>11900	8.96	>79.6
Yuba City	Surface Water/Effluent	114/164[1]	>8000	7.60/7.46	>53.5

The Discharger has not conducted a toxicity test for aluminum; however, the City of Manteca conducted toxicity tests in the San Joaquin River. As shown, the test water quality characteristics of the San Joaquin River near Manteca are similar for pH and hardness in the Sacramento River, with the hardness ranging from 57 mg/L to 156 mg/L as $CaCO_3$ in comparison to the hardness of the Sacramento River near the discharge that ranged from 34 mg/L to 100 mg/L as $CaCO_3$. Thus, results of the site-specific study conducted on the San Joaquin River near Manteca are representative of the Sacramento River near the discharge. Therefore, the City of Manteca aluminum toxicity test study is relevant for use in determining the specific numerical criteria to be used in determining compliance with the Basin Plan's narrative toxicity objective. The City of Manteca aluminum toxicity study resulted in a minimum site-specific aluminum objective of 7,823 µg/L. Thus, these results support the conclusion that the 87 µg/L chronic criterion is overly stringent for the Sacramento River near the discharge.

Applicable WQOs. This Order implements the Secondary MCL of 200 µg/L as an annual average for the protection of MUN and implements the Basin Plan's narrative toxicity objective for the protection of aquatic life using an acute (1-hour) criterion and chronic (4-day) criterion of 750 µg/L based on U.S. EPA's NAWQC and the discussion above. Order

R5-2010-0114-04 included effluent limitations for aluminum based on the Secondary MCL of 200 µg/L and the NAWQC acute aquatic life criterion of 750 µg/L.

(b) **RPA Results.** For priority pollutants, the SIP dictates the procedures for conducting the RPA. Aluminum is not a priority pollutant. Therefore, the Central Valley Water Board is not restricted to one particular RPA method. Due to the site-specific conditions of the discharge, the Central Valley Water Board has used its judgment in determining the appropriate method for conducting the RPA for this non-priority pollutant constituent. The most stringent objective is the Secondary MCL, which is derived from human welfare considerations (e.g., taste, odor, laundry staining), not for toxicity. Secondary MCL's are drinking water standards contained in Title 22 of the California Code of Regulations. Title 22 requires compliance with these standards on an annual average basis, when sampling at least quarterly. To be consistent with how compliance with the standards is determined, the RPA was conducted based on the calendar annual average effluent aluminum concentrations. Calculating a maximum annual average concentration considers variability in the data, per 40 C.F.R. § 122.44(d)(1)(ii).

The maximum annual average effluent concentration for aluminum was 17 µg/L based on 105 samples collected between January 2012 and December 2015. Effluent aluminum is consistently less than the concentrations in the receiving water and below the Secondary MCL and the NAWQC acute criterion. Therefore, the Central Valley Water Board finds the discharge does not have reasonable potential to cause or contribute to an exceedance in the receiving water and the Facility is adequately controlling the discharge of aluminum. Since the discharge does not demonstrate reasonable potential, the effluent limitations for aluminum have not been retained in this Order. Removal of these effluent limitations is in accordance with federal anti-backsliding regulations (see section IV.D.3 of the Fact Sheet).

ii. **Diazinon and Chlorpyrifos**

(a) **WQO.** The Central Valley Water Board completed a TMDL for diazinon and chlorpyrifos in the Sacramento – San Joaquin Delta Waterways and amended the Basin Plan to include diazinon and chlorpyrifos WLA's and water quality objectives. The Basin Plan Amendment for the Control of Diazinon and Chlorpyrifos Runoff into the Sacramento – San Joaquin Delta was adopted by the Central Valley Water Board on 23 June 2006 and became effective on 10 October 2007.

The amendment modified Basin Plan Chapter III (Water Quality Objectives) to establish site-specific numeric objectives for diazinon and chlorpyrifos in the Delta waterways and identified the requirements to meet the additive formula already in Basin Plan Chapter IV (Implementation) for the additive toxicity of diazinon and chlorpyrifos.

The amendment states that "*The Waste Load Allocations (WLA) for all NPDES-permitted dischargers…shall not exceed the sum (S) of one (1) as defined below.*

$$S = \frac{C_d}{WQO_d} + \frac{C_c}{WQO_c} \leq 1.0$$

Where:

C_D = diazinon concentration in µg/L of point source discharge for WLA…

C_C = chlorpyrifos concentration in µg/L of point source discharge for the WLA…

WQO_d = acute or chronic diazinon water quality objective in µg/L.

WQO_c = acute or chronic chlorpyrifos water quality objective in µg/L.

Available samples collected within the applicable averaging period for the water quality objective will be used to determine compliance with the allocations and loading capacity. For purposes of calculating the sum (S) above, analytical results that are reported as 'non-detectable' concentrations are considered to be zero."

Appendix A of the Diazinon and Chlorpyrifos TMDL lists waterways subject to the TMDL and includes the Sacramento River.

The water quality objectives for chlorpyrifos are 0.025 µg/L as a 1-hour average (acute) and 0.015 µg/L as a 4-day average (chronic), not to be exceeded more than once in a 3-year period. The water quality objectives for diazinon are 0.16 µg/L as a 1-hour average (acute) and 0.10 µg/L as a 4-day average (chronic), not to be exceeded more than once in a 3-year period.

(b) **RPA Results.** Diazinon was not detected in the effluent based on 38 samples collected between January 2012 and December 2014. The maximum observed upstream receiving water diazinon concentration was an estimated concentration of 0.0004 µg/L based on 36 samples collected between January 2012 and December 2014.

Chlorpyrifos was not detected in the effluent based on 38 samples collected between January 2012 and December 2014. The maximum observed upstream receiving water chlorpyrifos concentration was an estimated concentration of 0.004 µg/L based on 36 samples collected between January 2012 and December 2014.

Although diazinon and chlorpyrifos were not detected in the effluent, due to the TMDL for diazinon and chlorpyrifos in the San Joaquin River, WQBEL's for these constituents are required. The TMDL WLA applies to all NPDES dischargers to Delta waterways and will serve as the basis for WQBEL's.

(c) **WQBEL's.** WQBEL's for diazinon and chlorpyrifos are required based on the TMDL for diazinon and chlorpyrifos for the Sacramento – San Joaquin Delta. Therefore, this Order includes effluent limits calculated based on the WLA's contained in the TMDL, as follows:

(1) Average Monthly Effluent Limitation (AMEL)

$$S_{AMEL} = \frac{C_{D\,M-avg}}{0.079} + \frac{C_{C\,M-avg}}{0.012} \leq 1.0$$

$C_{D\,M\text{-}avg}$ = average monthly diazinon effluent concentration in µg/L.

$C_{C\,M\text{-}avg}$ = average monthly chlorpyrifos effluent concentration in µg/L.

(2) Average Weekly Effluent Limitation (AWEL)

$$S_{AWEL} = \frac{C_{D\,W-avg}}{0.14} + \frac{C_{C\,W-avg}}{0.021} \leq 1.0$$

$C_{D\,W\text{-}avg}$ = average weekly diazinon effluent concentration in µg/L.

$C_{C\,W\text{-}avg}$ = average weekly chlorpyrifos effluent concentration in µg/L.

(d) **Plant Performance and Attainability.** Diazinon and chlorpyrifos were not detected in the effluent. The Central Valley Water Board concludes, therefore, that immediate compliance with these effluent limitations is feasible.

iii. **Dibenzo(a,h)anthracene**

(a) **WQO.** The CTR includes a criterion of 0.0044 µg/L for dibenzo(a,h)anthracene for the protection of human health for waters from which both water and organisms are consumed. Order R5-2010-0114-04 included effluent limitations for dibenzo(a,h)anthracene based on the CTR criterion.

(b) **RPA Results.** Dibenzo(a,h)anthracene was not detected in the effluent based on 105 samples collected between January 2012 and December 2014. Dibenzo(a,h)anthracene was not detected in the upstream receiving water based on 25 samples collected between January 2012 and December 2014. Therefore, the discharge does not demonstrate reasonable potential to cause or contribute to an in-stream excursion above the CTR criteria for dibenzo(a,h)anthracene, and the effluent limitations for dibenzo(a,h)anthracene have not been retained in this Order. Removal of these effluent limitations is in accordance with federal anti-backsliding regulations (see section IV.D.3 of the Fact Sheet).

iv. **1,2-Diphenylhydrazine**

(a) **WQO.** The CTR includes a criterion of 0.040 µg/L for 1,2-diphenylhydrazine for the protection of human health for waters from which both water and organisms are consumed.

(b) **RPA Results.** Order R5-2010-0114-04 concluded that insufficient information was available to make a determination whether 1,2-diphenylhydrazine in the discharge had reasonable potential to exceed the CTR criterion, and required the Discharger to conduct a study to evaluate the effluent using appropriate analytical methods. The Discharger submitted the study results to the Central Valley Water Board on 16 July 2013, which concluded that 1,2-diphenylhydrazine was not detected in the effluent based on effluent sampling conducted every 3 weeks over a 54 week period.

1,2-diphenylhydrazine was not detected in the effluent based on 52 samples collected between January 2012 and December 2014.

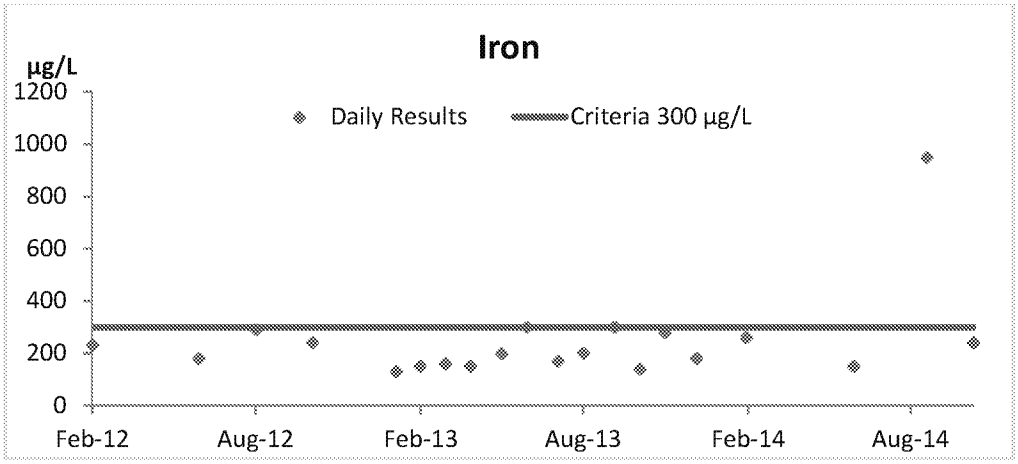
1,2-diphenylhydrazine was not detected in the upstream receiving water based on 12 samples collected between January 2012 and December 2014. Therefore, the discharge does not demonstrate reasonable potential to cause or contribute to an in-stream excursion above the CTR criteria for 1,2-diphenylhydrazine.

v. **Iron**

(a) **WQO.** The Secondary MCL – Consumer Acceptance Limit for iron is 300 µg/L, which is used to implement the Basin Plan's chemical constituent objective for the protection of municipal and domestic supply. The Basin Plan contains a site-specific numeric objective for the Delta of 300 µg/L (maximum concentration) for iron, expressed as dissolved metal, based on the Secondary MCL.

(b) **RPA Results.** For priority pollutants, the SIP dictates the procedures for conducting the RPA. Iron is not a priority pollutant. Therefore, the Central Valley Water Board is not restricted to one particular RPA method. Due to the site-specific conditions of the discharge, the Central Valley Water Board has used its judgment in determining the appropriate method for conducting the RPA for this non-priority pollutant constituent. The most stringent objective is the site-specific Basin Plan objective based on the Secondary MCL, which is derived from human welfare considerations (e.g., taste, odor, laundry staining), not for toxicity. Secondary MCL's are drinking water standards contained in Title 22 of the California Code of Regulations. Title 22 requires compliance with these standards on an annual average basis, when sampling at least quarterly. To be consistent with how compliance with the standards is determined, the RPA was conducted based on the calendar annual average effluent iron concentrations. Calculating a maximum annual average concentration considers variability in the data, per 40 C.F.R. § 122.44(d)(1)(ii).

The maximum effluent iron concentration was 950 µg/L, based on 20 samples collected between January 2012 and December 2014. The mean value of the effluent data was 245 µg/L and the standard deviation was 175 µg/L. The remaining results for iron in the effluent ranged from 130 µg/L to 300 µg/L, as shown in the figure below. The maximum effluent iron concentration, which was observed on 24 August 2014, was determined to be an outlier based on both Rosner's outlier test and Grubbs outlier test. Rosner's outlier test is the recommended test by the U.S. EPA and the Grubbs outlier test is the recommended test when testing for a single outlier by the State Water Board, Division of Water Quality.



The Central Valley Water Board has determined that the 24 August 2014 effluent result of 950 µg/L is not representative of the discharge from the Facility. Excluding the 24 August 2014 result, the maximum annual average effluent concentration for iron was 235 µg/L. Although the receiving water contains iron exceeding the Secondary MCL, the effluent iron is consistently less than the concentrations in the receiving water and below the Secondary MCL. Therefore, the Central Valley Water Board finds the discharge does not have reasonable potential to cause or contribute to an exceedance in the receiving water and the Facility is adequately controlling the discharge of iron.

vi. **Manganese**

(a) **WQO.** The Secondary MCL – Consumer Acceptance Limit for manganese is 50 µg/L, which is used to implement the Basin Plan's chemical constituent objective for the protection of municipal and domestic supply. The Basin Plan contains a site-specific numeric objective for the Delta of 50 µg/L (maximum concentration) for manganese, expressed as dissolved metal, based on the Secondary MCL. Order R5-2010-0114-01 established an effluent limitation for manganese based on the Secondary MCL.

(b) **RPA Results.** For priority pollutants, the SIP dictates the procedures for conducting the RPA. Manganese is not a priority pollutant. Therefore, the Central Valley Water Board is not restricted to one particular RPA method. Due to the site-specific conditions of the discharge, the Central Valley Water Board has used its judgment in determining the appropriate method for conducting the RPA for this non-priority pollutant constituent. For conducting the RPA, U.S. EPA recommends using a mass-balance approach to determine the expected critical downstream receiving water concentration using a steady-state approach[1]. This downstream receiving water concentration is then compared to the applicable water quality objectives to determine if the discharge has reasonable potential to cause or contribute to an in-stream excursion. This approach allows assimilative capacity and dilution to be factored into the RPA. This U.S. EPA recommended approach has been used for manganese. The critical

[1] U.S. EPA NPDES Permit Writers' Course (EPA 833-B-97-001 rev. October 2009)

downstream receiving water concentration is calculated using the following equation:

$$C_r = \frac{Q_s C_s + Q_d C_d}{Q_s + Q_d}$$

Where:

Q_s = Critical stream flow (1Q10) for acute criteria, (7Q10) for chronic criteria, harmonic mean flow for human carcinogen criteria, and (30Q5) for non-human carcinogen criteria

Q_d = Critical effluent flow from discharge flow data (maximum permitted discharge)

C_s = Critical upstream pollutant concentration

C_d = Critical effluent pollutant concentration

C_r = Critical downstream receiving water pollutant concentration

The Secondary MCL is a long-term objective. As described in section IV.C.2.c.vi, the TSD recommends dilution based on a 30Q5 receiving water flow for non-human carcinogen human health criteria. Therefore, a critical stream flow (Q_s) of 8,234 cfs (5,322 MGD), which represents the 30Q5 receiving water flow, was used for the RPA for manganese. The critical effluent flow, Q_d, is 181 MGD, which is the maximum permitted flow allowed in this Order. Title 22 requires compliance with the Secondary MCL for manganese based on an annual average concentration, therefore, a critical effluent pollutant concentration, C_d, of 79 µg/L was determined by projecting the running annual average manganese concentration using statistics recommended in the TSD for statistically projecting effluent concentrations (i.e., Table 3-1 of the TSD using the 99% probability basis and 99% confidence level). Since the Secondary MCL for manganese is a long-term objective and was derived from human welfare considerations (e.g., taste, odor, laundry staining), a critical upstream pollutant concentration, C_s, of 20 µg/L was determined using the ambient background concentration as an arithmetic mean.

Q_s = 5,322 MGD

Q_d = 181 MGD

C_s = 20 µg/L

C_d = 79 µg/L

$$C_r = \frac{(5{,}322\ MGD \times 20\ \mu g/L) + (181\ MGD \times 79\ \mu g/L)}{(5{,}322\ MGD + 181\ MGD)} = 22\ \mu g/$$

The critical downstream receiving water manganese concentration, C_r, is22 mg/L, which does not exceed the Secondary MCL. Therefore, the discharge does not have reasonable potential for manganese and the WQBEL for manganese has not been retained in this Order. Removal of this effluent limitation is in accordance with federal anti-backsliding regulations (see section IV.D.3 of the Fact Sheet).

vii. **Methyl Tertiary Butyl Ether**

(a) **WQO.** The Secondary MCL – Consumer Acceptance Limit for methyl tertiary butyl ether is 5.0 µg/L, which is used to implement the Basin Plan's chemical constituent objective for the protection of municipal and domestic supply. Order R5-2010-0114-01 established an effluent limitation for methyl tertiary butyl ether based on the Secondary MCL.

(b) **RPA Results.** For priority pollutants, the SIP dictates the procedures for conducting the RPA. Methyl tertiary butyl ether is not a priority pollutant. Therefore, the Central Valley Water Board is not restricted to one particular RPA method. Due to the site-specific conditions of the discharge, the Central Valley Water Board has used its judgment in determining the appropriate method for conducting the RPA for this non-priority pollutant constituent. The most stringent objective is the Secondary MCL, which is derived from human welfare considerations (e.g., taste, odor, laundry staining), not for toxicity. Secondary MCL's are drinking water standards contained in Title 22 of the California Code of Regulations. Title 22 requires compliance with these standards on an annual average basis, when sampling at least quarterly. To be consistent with how compliance with the standards is determined, the RPA was conducted based on the calendar annual average effluent methyl tertiary butyl ether concentrations.

Methyl tertiary butyl ether was not detected in the effluent based on 41 samples collected between January 2012 and December 2015. Effluent Methyl tertiary butyl ether is consistently less than the concentrations in the receiving water and below the Secondary MCL. Therefore, the Central Valley Water Board finds the discharge does not have reasonable potential to cause or contribute to an exceedance in the receiving water and the Facility is adequately controlling the discharge of methyl tertiary butyl ether. Since the discharge does not demonstrate reasonable potential, the effluent limitation for methyl tertiary butyl ether has not been retained in this Order. Removal of this effluent limitation is in accordance with federal anti-backsliding regulations (see section IV.D.3 of the Fact Sheet).

viii. **Pentachlorophenol**

(a) **WQO.** The CTR includes a criterion of 0.28 µg/L for pentachlorophenol for the protection of human health for waters from which both water and organisms are consumed. Order R5-2010-0114-01 included an effluent limitation for pentachlorophenol based on the CTR criterion.

(b) **RPA Results.** Pentachlorophenol was not detected in the effluent based on 101 samples collected between January 2012 and December 2014. Pentachlorophenol was not detected in the upstream receiving water based on 12 samples collected between January 2012 and December 2014. Therefore, the discharge does not demonstrate reasonable potential to cause or contribute to an in-stream excursion above the CTR criteria for pentachlorophenol, and the effluent limitations for pentachlorophenol have not been retained in this Order. Removal of these effluent limitations is in accordance with federal anti-backsliding regulations (see section IV.D.3 of the Fact Sheet).

ix. **Perchlorate**

(a) **WQO.** DDW has adopted a Primary MCL for perchlorate of 6 µg/L, which is protective of the Basin Plan's chemical constituent objective.

(b) **RPA Results.** Order R5-2010-0114-04 concluded that insufficient information was available to make a determination whether perchlorate in the discharge had reasonable potential to exceed the Primary MCL, and required the Discharger to conduct a study to evaluate the effluent using appropriate analytical methods. The Discharger submitted the study results to the Central Valley Water Board on 16 July 2013, which concluded that the maximum observed effluent perchlorate concentration was 1.06 µg/L based on effluent sampling conducted every 3 weeks over a 54 week period. Therefore, the discharge does not demonstrate reasonable potential to cause or contribute to an in-stream excursion above the CTR criteria for perchlorate.

x. **Salinity**

(a) **WQO.** The Basin Plan contains a chemical constituent objective that incorporates state MCL's for electrical conductivity, total dissolved solids, sulfate, and chloride. In addition, the Basin Plan contains numeric site-specific water quality objectives for electrical conductivity and chloride for the Sacramento River at Emmaton in the vicinity of the discharge. The site-specific objectives for electrical conductivity are based on protection of the agricultural supply beneficial use. In addition, U.S. EPA has developed NAWQC for chloride for the protection of aquatic life.

Table F-10. Salinity Water Quality Criteria/Objectives

Parameter	Agricultural WQ Objective[1]	Secondary MCL[2]	U.S. EPA NAWQC	Effluent	
				Average[3]	Maximum
EC (µmhos/cm) or TDS (mg/L)	Varies[2]	900, 1600, 2200 or 500, 1000, 1500	N/A	907 (EC) 435 (TDS)	1,000 (EC) 620 (TDS)
Sulfate (mg/L)	Varies	250, 500, 600	N/A	110	130
Chloride (mg/L)	Varies	250, 500, 600	860 1-hr 230 4-day	106	110

1 Narrative chemical constituent objective of the Basin Plan. Procedures for establishing the applicable numeric limitation to implement the narrative objective can be found in the Policy for Application of Water Quality, Chapter IV, Section 8 of the Basin Plan. However, the Basin Plan does not require improvement over naturally occurring background concentrations. In cases where the natural background concentration of a particular constituent exceeds an applicable water quality objective, the natural background concentration will be considered to comply with the objective.

2 The Secondary MCL's are stated as a recommended level, upper level, and a short-term maximum level.

3 Maximum calendar annual average.

(1) **Chloride.** The Secondary MCL for chloride is 250 mg/L, as a recommended level, 500 mg/L as an upper level, and 600 mg/L as a short-term maximum. The NAWQC acute and chronic criteria are 860 mg/L and 230 mg/L, respectively.

(2) **Electrical Conductivity or Total Dissolved Solids.** The Secondary MCL for electrical conductivity is 900 µmhos/cm as a recommended level, 1600 µmhos/cm as an upper level, and 2200 µmhos/cm as a short-term maximum, or when expressed as TDS is 500 mg/L as a recommended level, 1000 mg/L as an upper level, and 1500 mg/L as a short-term maximum.

The Basin Plan contains site-specific water quality objectives for electrical conductivity for the Sacramento River at Emmaton based on the 2006 Bay-Delta Plan. The electrical conductivity objectives vary depending on the water year type and are applied as 14-day running average of the mean daily electrical conductivity, as detailed in the table below:

Table F-11. Water Quality Objectives for Electrical Conductivity

Date	Water Year Type				
	Wet	Above Normal	Below Normal	Dry	Critical
1 April – 14 June	450	450	450	450	2,780
15 June – 19 June	450	450	450	1,670	2,780
20 June – 30 June	450	450	1,140	1,670	2,780
1 July – 15 August	450	630	1,140	1,670	2,780

The Bay-Delta Plan, Chapter IV – Program of Implementation, requires that the EC objectives for protection of AGR to be implemented through water rights actions. Consequently, compliance with the Bay-Delta Plan's electrical conductivity objectives is met through reservoir operations by DWR and USBR. An evaluation of historical compliance from 1999 to 2012 was performed and the results of the evaluation are summarized in the table below. Not considering the exceedances during the Jones Tract levee break in June 2004, which was an unusual event, the Sacramento River at Emmaton has been in compliance with the objectives.

Table F-12. Historical Compliance with Electrical Conductivity Objectives at Emmaton (Water Years 1999-2012)

Water Year Type	Number of Years of this Type	Number of Years with Exceedances	Year with Exceedances (number of days)	Applicable Objectives[1] (µmhos/cm)
Wet	3	0	0	450
Above Normal	3	0	0	450/630
Below Normal	3	1	2004 (13)[1]	450/1,140
Dry	4	0	0	450/1,670
Critically Dry	1	0	0	2,780

[1] Objectives apply from April 1 through August 15 as 14-day running daily averages. Objectives change in certain water years partway through June.

[2] The Jones Tract levee break occurred on 3 June 2004, and was closed on 30 June 2004; the exceedances of criteria, 450 µmhos/cm as 14-day running averages, occurred from 10-21 June 2004.

(3) **Sulfate.** The Secondary MCL for sulfate is 250 mg/L as a recommended level, 500 mg/L as an upper level, and 600 mg/L as a short-term maximum.

(b) **RPA Results.** For priority pollutants, the SIP dictates the procedures for conducting the RPA. Electrical conductivity, total dissolved solids, sulfate, and chloride are not priority pollutants. Therefore, the Central Valley Water Board is not restricted to one particular RPA method. The SIP RPA procedures have been used for chloride. However, due to the site-specific conditions of the discharge, the Central Valley Water Board has used its judgment in determining the appropriate method for conducting the RPA for EC, TDS, and sulfate.

For sulfate and TDS the most stringent objective is the site-specific Basin Plan objective based on the Secondary MCL, which is derived from human welfare considerations (e.g., taste, odor, laundry staining), not for toxicity. Secondary MCL's are drinking water standards contained in Title 22 of the California Code of Regulations. Title 22 requires compliance with these standards on an annual average basis, when sampling at least quarterly. To be consistent with how compliance with the standards is determined, the RPA was conducted based on the calendar annual average effluent iron concentrations. Calculating a maximum annual average concentration considers variability in the data, per 40 C.F.R. § 122.44(d)(1)(ii).

For EC the RPA was conducted using U.S. EPA's recommended mass-balance approach to determine the expected critical downstream receiving water concentration using a steady-state approach[1]. This downstream receiving water concentration is then compared to the applicable water quality objectives to determine if the discharge has reasonable potential to cause or contribute to an in-stream excursion. This approach allows assimilative capacity and dilution to be factored into the RPA. The critical downstream receiving water concentration is calculated using the following equation:

$$C_r = \frac{Q_s C_s + Q_d C_d}{Q_s + Q_d}$$

Where:

Q_s = Critical stream flow (1Q10) for acute criteria, (7Q10) for chronic criteria, harmonic mean flow for human carcinogen criteria, and (30Q5) for non-human carcinogen criteria

Q_d = Critical effluent flow from discharge flow data (maximum permitted discharge)

C_s = Critical upstream pollutant concentration

C_d = Critical effluent pollutant concentration

C_r = Critical downstream receiving water pollutant concentration

The Basin Plan's EC water quality objectives are based on a 14-day running average. Therefore, a critical stream flow (Q_s) of 5,060 cfs (3270 MGD), which represents the 7Q10 receiving water flow, was used for the RPA for EC. The critical effluent flow, Q_d, is 181 MGD, which is the maximum permitted flow allowed in this Order. The critical effluent

[1] U.S. EPA NPDES Permit Writers' Handbook (EPA 833-K-10-001 September 2010)

pollutant concentration, C_d, was determined using statistics recommended in the TSD for statistically calculating the projected maximum effluent concentration (i.e., Table 3-1 of the TSD using the 99% probability basis and 99% confidence level).

(1) **Chloride.** Chloride concentrations in the effluent ranged from 87 mg/L to 110 mg/L, with a maximum observed calendar year annual average of 106 mg/L based on 20 samples collected between January 2012 and December 2014. Background concentrations in the Sacramento River ranged from 3.7 mg/L to 11 mg/L, with a maximum observed calendar year annual average of 7.4 mg/L, based on 25 samples collected between January 2012 through December 2014. These levels do not exceed the NAWQC chronic criterion. Therefore, the discharge does not have reasonable potential for chloride.

(2) **Sulfate.** Sulfate concentrations in the effluent ranged from 54 mg/L to 130 mg/L, with a maximum observed calendar year annual average of 110 mg/L based on 21 samples collected between January 2012 and December 2014. Background concentrations in the Sacramento River ranged from 4.8 mg/L to 16 mg/L, with a maximum observed calendar year annual average of 7.5 mg/L based on 12 samples collected between January 2012 and December 2014. These levels do not exceed the Secondary MCL. Therefore, the discharge does not have reasonable potential for sulfate.

(3) **Total Dissolved Solids.** Total dissolved solids concentrations in the effluent ranged from 280 mg/L to 620 mg/L, with a maximum observed calendar year annual average of 435 mg/L based on 333 samples collected between January 2012 and December 2014. Background concentrations in the Sacramento River ranged from 68 mg/L to 150 mg/L, with a maximum observed calendar year annual average of 119 mg/L based on 25 samples collected between January 2012 and December 2014. These levels do not exceed the Secondary MCL. Therefore, the discharge does not have reasonable potential for TDS.

(4) **Electrical Conductivity**. Electrical conductivity concentrations in the effluent ranged from 540 µmhos/cm to 1,000 µmhos/cm with a maximum observed calendar year annual average of 907 µmhos/cm based on 315 samples collected between January 2012 and December 2014. Electrical conductivity concentrations in the upstream receiving water ranged from 100 µmhos/cm to 246 µmhos/cm with a maximum observed calendar year annual average of 176 µmhos/cm based on 199 samples collected between January 2012 and December 2014. The receiving water has been consistently in compliance with the Bay-Delta objectives resulting in available assimilative capacity for consideration in the RPA. Considering the large dilution and assimilative capacity in the receiving water, the small increase in electrical conductivity caused by the discharge does not result in a reasonable potential to cause or contribute to an exceedance of the objectives for electrical conductivity in the receiving water.

The projected maximum effluent electrical conductivity concentration is 1,013 µmhos/cm. Receiving water electrical conductivity data in the Sacramento River gives the day with the maximum electrical conductivity as 246 µmhos/cm from 18 February 2014. This represents the reasonable worst-case scenario for evaluating the impact of the discharge on the receiving water.

Q_s = 3,270 MGD

Q_d = 181 MGD

C_s = 246 µmhos/cm

C_d = 1,013 µmhos/cm

$$C_r = \frac{(3{,}270\ MGD \times 246\ \mu mhos/cm\ ) + (181\ MGD \times 1{,}013\ \mu mhos/cm\ )}{(3{,}270\ MGD + 181\ MGD)}$$
$$= 286\ \mu mhos/cm$$

The critical downstream receiving water concentration, Cr, is 286 µmhos/cm, which does not exceed the Bay-Delta Objective of 450 µmhos/cm. Therefore, the discharge does not have reasonable potential for electrical conductivity.

Table F-13, below, shows a summary of the reasonable potential determination for EC.

Table F-13. Water Quality Criteria/Objectives and Effluent and Receiving Water Concentrations

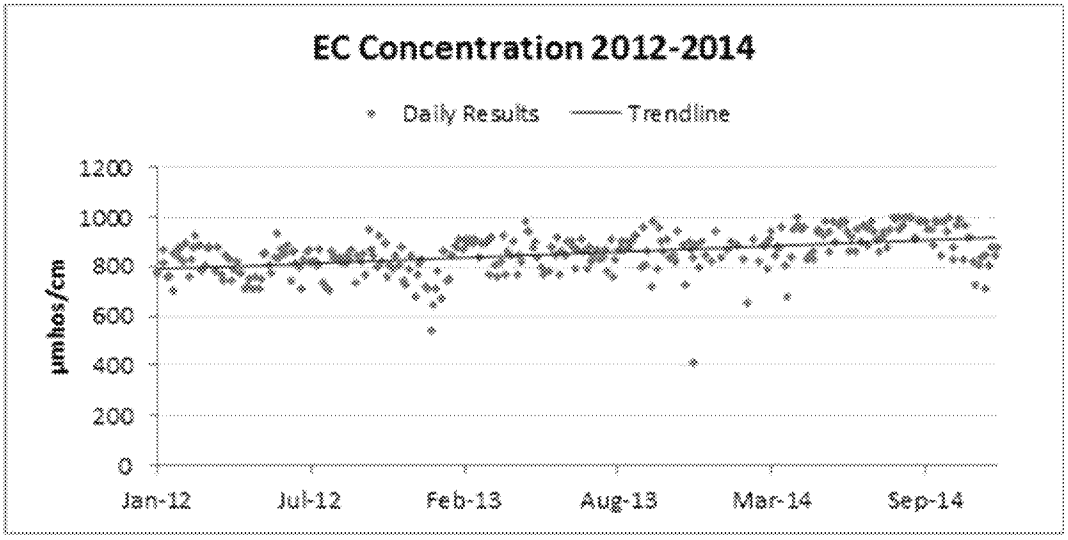
Parameter	Sacramento River Max	Effluent		TSD Max. RW Conc.[2]	WQO	RP?
		MEC	Projected MEC[1]			
EC (µmhos/cm)	246	1,000	1,013	271	varies[3] 450~2780	No

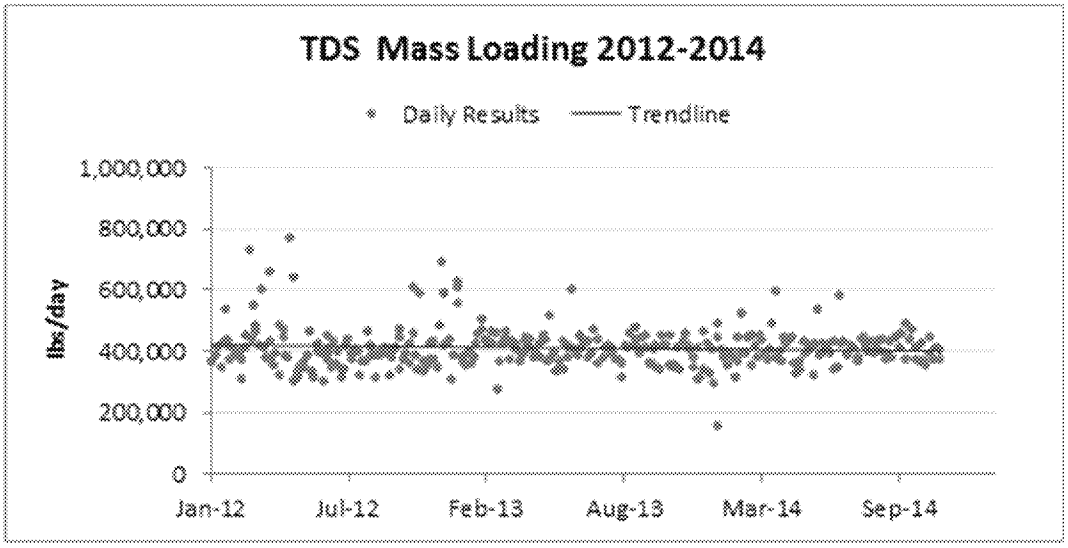
1 Projected maximum effluent concentration using Table 3-1 from TSD.
2 Critical downstream receiving water pollutant concentration using mass balance, $C_r = (Q_sC_s + Q_dC_d)/ (Q_s+ Q_d)$.
3 EC = Bay-Delta Plan, Sacramento River at Emmaton in the Western Delta.

(c) **WQBEL's.** Based on the relatively low reported salinity, the discharge does not have reasonable potential to cause or contribute to an in-stream excursion of water quality objectives for salinity. However, since the Discharger discharges to the Sacramento River within the Sacramento-San Joaquin Delta, of additional concern is the salt contribution to Delta waters. Allowing the Discharger to increase its current salt loading may be contrary to the Region-wide effort to address salinity in the Central Valley. Therefore, this Order includes a performance-based effluent limitation for electrical conductivity.

Order R5-2010-0114-04 included a performance-based annual average effluent limitation of 900 µmhos/cm. However, due to drought conditions and ongoing water conservations efforts during the term of Order R5-2010-0114-04, the Facility experienced increasing effluent salinity concentrations and the Discharger exceeded the annual average effluent limitation once (in 2014). In 2016, the Discharger is planning to convert the

disinfection process from a gaseous to a liquid disinfection process for safety and treatment efficiency purposes. This conversion is expected to temporarily increase salinity levels. The salinity levels are expected to decrease after the BNR process is online in 2020. Although effluent electrical conductivity concentrations have been increasing, the mass loading of salinity is not increasing over time, as shown in the following figures. Therefore, this Order includes a revised performance-based annual average effluent limitation of 1,139 µmhos/cm, which reflects the projected effluent quality until the BNR facilities come online.





In order to ensure that the Discharger will continue to control the discharge of salinity, this Order includes a requirement to continue to implement a salinity evaluation and minimization plan.

(d) **Plant Performance and Attainability.** The effluent limitation for electrical conductivity is based on projected Facility performance. The Central Valley Water Board concludes, therefore, that immediate compliance with this effluent limitation is feasible.

xi. **Tetrachloroethylene**

(a) **WQO.** The CTR includes a criterion of 0.8 µg/L for tetrachloroethylene for the protection of human health for waters from which both water and organisms are consumed. Order R5-2010-0114-01 included an effluent limitation for tetrachloroethylene based on the CTR criterion.

(b) **RPA Results.** Tetrachloroethylene was not detected in the effluent based on 41 samples collected between January 2012 and December 2014. Tetrachloroethylene was not detected in the upstream receiving water based on 12 samples collected between January 2012 and December 2014. Therefore, the discharge does not demonstrate reasonable potential to cause or contribute to an in-stream excursion above the CTR criteria for tetrachloroethylene, and the effluent limitations for tetrachloroethylene have not been retained in this Order. Removal of these effluent limitations is in accordance with federal anti-backsliding regulations (see section IV.D.3 of the Fact Sheet).

b. **Constituents with No Data or Insufficient Data.** Reasonable potential cannot be determined for the following constituents because effluent data are limited or ambient background concentrations are not available. The Discharger is required to continue to monitor for these constituents in the effluent using analytical methods that provide the best feasible detection limits. When additional data become available, further analysis will be conducted to determine whether to add numeric effluent limitations or to continue monitoring.

i. **N-Nitrosodimethylamine**

(a) **WQO.** The CTR includes a criterion of 0.00069 µg/L for n-nitrosodimethylamine for the protection of human health for waters from which both water and organisms are consumed.

(b) **RPA Results.** As shown in the table below, based on data collected between January 2012 and December 2014, the MEC for n-nitrosodimethylamine exceeds the applicable CTR criterion.

Table F-14. Data Summary for N-nitrosodimethylamine

Parameter	Effluent				Background (µg/L)	Lowest MDL (µg/L)	Lowest RL (µg/L)	SIP ML (µg/L)
	MEC (µg/L)	No. of Samples	No. of ND	No. of DNQ				
N-nitrosodimethylamine	0.035 (DNQ)	45	13	32	<0.05	0.00028	0.002	5

SIP Section 2.4.2 states that the Minimum Level (ML) is the lowest quantifiable concentration in a sample based on the proper application of all method-based analytical procedures and the absence of any matrix interferences.

(1) Required ML's are listed in Appendix 4 of the SIP. Where more than one ML is listed in Appendix 4, the Discharger may select any one of the cited analytical methods for compliance determination. The selected ML used for compliance determination is referred to as the Reporting Level (RL).

(2) An RL can be lower than the ML in Appendix 4 only when the Discharger agrees to use a RL that is lower than the ML listed in

Appendix 4. The Central Valley Water Board and the Discharger have no agreement to use a RL lower than the listed ML.

(3) SIP Section 1.2 requires that the Regional Board use all available, valid, relevant, representative data and information, as determined by the Regional Board, to implement the SIP. SIP Section 1.2 further states that the Regional Board has the discretion to consider if any data are inappropriate or insufficient for use in implementing the SIP.

(4) Data reported below the ML indicates the data may not be valid due to possible matrix interferences during the analytical procedure.

(5) Further, SIP Section 2.4.5 (Compliance Determination) supports the insufficiency of data reported below the ML or RL. In part it states, "*Dischargers shall be deemed out of compliance with an effluent limitation, for reporting and administrative enforcement purposes, if the concentration of the priority pollutant in the monitoring sample is greater than the effluent limitation and greater than or equal to the RL.*" Thus, if submitted data is below the RL, that data cannot be used to determine compliance with effluent limitations.

(6) Data reported below the ML is not considered valid data for use in determining reasonable potential. Therefore, in accordance with Section 1.2 of the SIP, the Central Valley Water Board has determined that data reported below the ML is inappropriate and insufficient to be used to determine reasonable potential.

(7) In implementing its discretion, the Central Valley Water Board is not finding that reasonable potential does not exist; rather the Central Valley Water Board cannot make such a determination given the invalid data. Therefore, the Central Valley Water Board will require additional monitoring for such constituents until such time a determination can be made in accordance with the SIP policy.

The lowest applicable ML cited in SIP Appendix 4 for n-nitrosodimethylamine is 5 µg/L. The Discharger used analytical methods that were more sensitive than the ML required by the SIP. In their 2012 annual progress report, the Discharger provided the results of research treatment technologies and sources, laboratory analysis methods, and laboratories that conduct analyses at low RL's, and concluded that ultra-low RL's for n-nitrosodimethylamine are not reliable and there are no laboratories that can achieve valid and reliable results for n-nitrosodimethylamine. The effluent results were all below the applicable SIP ML. Therefore, the submitted effluent data for these constituents is inappropriate and insufficient to determine reasonable potential under the SIP.

Section 1.3, Step 8 of the SIP allows the Central Valley Water Board to require additional monitoring for a pollutant in place of an effluent limitation if data are unavailable or insufficient. Instead of limitations, additional monitoring has been established for n-nitrosodimethylamine in both the effluent and the receiving water. Should monitoring results indicate that the discharge has the reasonable potential to cause or contribute to an exceedance of a water quality standard, this Order may be reopened and modified by adding an appropriate effluent limitation.

ii. **Polycyclic Aromatic Hydrocarbons (PAH's)**

(a) **WQO.** Benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, and chrysene are PAH's. The CTR includes criteria of 0.0044 µg/L for each of these PAH's for the protection of human health for waters from which both water and organisms are consumed.

(b) **RPA Results.** As shown in the table below, based on data collected between January 2012 and December 2014, the MEC's for benzo(a)anthracene, benzo(b)fluoranthene, and chrysene and the maximum background concentration of benzo(k)fluoranthene exceed the applicable CTR criteria.

Table F-15. Data Summary for PAH's

Parameter	Effluent				Background (µg/L)	MDL (µg/L)	RL (µg/L)	SIP ML (µg/L)
	MEC (µg/L)	No. of Samples	No. of ND	No. of DNQ				
Benzo(a)anthracene	0.0067	38	24	10	0.0023	0.001	0.005	5
Benzo(b)fluoranthene	0.0057	38	35	2	0.0054 (DNQ)	0.001	0.005	10
Benzo(k)fluoranthene	0.0033 (DNQ)	38	35	3	0.005	0.001	0.005	2
Chrysene	0.0129	38	22	13	0.0114	0.001	0.005	5

SIP Section 2.4.2 states that the ML is the lowest quantifiable concentration in a sample based on the proper application of all method-based analytical procedures and the absence of any matrix interferences.

(1) Required ML's are listed in Appendix 4 of the SIP. Where more than one ML is listed in Appendix 4, the Discharger may select any one of the cited analytical methods for compliance determination. The selected ML used for compliance determination is referred to as the RL.

(2) An RL can be lower than the ML in Appendix 4 only when the Discharger agrees to use a RL that is lower than the ML listed in Appendix 4. The Central Valley Water Board and the Discharger have no agreement to use a RL lower than the listed ML.

(3) SIP Section 1.2 requires that the Regional Board use all available, valid, relevant, representative data and information, as determined by the Regional Board, to implement the SIP. SIP Section 1.2 further states that the Regional Board has the discretion to consider if any data are inappropriate or insufficient for use in implementing the SIP.

(4) Data reported below the ML indicates the data may not be valid due to possible matrix interferences during the analytical procedure.

(5) Further, SIP Section 2.4.5 (Compliance Determination) supports the insufficiency of data reported below the ML or RL. In part it states, "*Dischargers shall be deemed out of compliance with an effluent limitation, for reporting and administrative enforcement purposes, if the concentration of the priority pollutant in the monitoring sample is greater than the effluent limitation and greater than or equal to the RL.*" Thus, if submitted data is below the RL, that data cannot be used to determine compliance with effluent limitations.

(6) Data reported below the ML is not considered valid data for use in determining reasonable potential. Therefore, in accordance with Section 1.2 of the SIP, the Central Valley Water Board has determined that data reported below the ML is inappropriate and insufficient to be used to determine reasonable potential.

(7) In implementing its discretion, the Central Valley Water Board is not finding that reasonable potential does not exist; rather the Central Valley Water Board cannot make such a determination given the invalid data. Therefore, the Central Valley Water Board will require additional monitoring for such constituents until such time a determination can be made in accordance with the SIP policy.

The lowest applicable ML's cited in SIP Appendix 4 for benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, and chrysene are 5 µg/L, 10 µg/L, 2 µg/L, and 5 µg/L, respectively. The Discharger used analytical methods that were more sensitive than the ML required by the SIP. The effluent results were all below the applicable SIP ML's. Therefore, the submitted effluent data for these constituents is inappropriate and insufficient to determine reasonable potential under the SIP.

The upstream receiving water concentration of 0.005 µg/L for benzo(k)fluoranthene does exceed the CTR chronic criterion. Section 1.3, Step 6 of the SIP states that if the receiving water concentration exceeds the criteria and the pollutant is detected in the effluent, an effluent limitation is required. However, as discussed in detail above, chrysene was not detected in the effluent in concentrations greater than the applicable SIP ML and, therefore, insufficient effluent data is available at this time to justify establishing an effluent limitation for chrysene.

Section 1.3, Step 8 of the SIP allows the Central Valley Water Board to require additional monitoring for a pollutant in place of an effluent limitation if data are unavailable or insufficient. Instead of limitations, additional monitoring has been established for benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, and chrysene in both the effluent and the receiving water. Should monitoring results indicate that the discharge has the reasonable potential to cause or contribute to an exceedance of a water quality standard, this Order may be reopened and modified by adding an appropriate effluent limitation.

c. **Constituents with Reasonable Potential.** The Central Valley Water Board finds that the discharge has a reasonable potential to cause or contribute to an in-stream excursion above a water quality standard for ammonia, bis (2-ethylhexyl) phthalate, BOD_5, carbon tetrachloride, chlorine residual, chlorodibromomethane, copper, cyanide, dichlorobromomethane, mercury, methylene chloride, nitrate plus nitrite, pathogens, pH, temperature, and TSS. WQBEL's for these constituents are included in this Order. A summary of the RPA is provided in Attachment G, and a detailed discussion of the RPA for each constituent is provided below.

i. **Ammonia**

(a) **WQO.** The 1999 NAWQC for the protection of freshwater aquatic life for total ammonia (the "1999 Criteria"), recommends acute (1-hour average; criteria maximum concentration or CMC) standards based on pH and

chronic (30-day average; criteria continuous concentration or CCC) standards based on pH and temperature. U.S. EPA also recommends that no 4-day average concentration should exceed 2.5 times the 30-day CCC. U.S. EPA found that as pH increased, both the acute and chronic toxicity of ammonia increased. Salmonids were more sensitive to acute toxicity effects than other species. However, while the acute toxicity of ammonia was not influenced by temperature, it was found that invertebrates and young fish experienced increasing chronic toxicity effects with increasing temperature.

The U.S. EPA recently published national recommended water quality criteria for the protection of aquatic life from the toxic effects of ammonia in freshwater (the "2013 Criteria")[1]. The 2013 Criteria is an update to U.S. EPA's 1999 Criteria, and varies based on pH and temperature. Although the 2013 Criteria reflects the latest scientific knowledge on the toxicity of ammonia to certain freshwater aquatic life, including new toxicity data on sensitive freshwater mussels in the Family Unionidae, the species tested for development of the 2013 Criteria may not be present in some Central Valley waterways. The 2013 Criteria document therefore states that, "*unionid mussel species are not prevalent in some waters, such as the arid west …*" and provides that, "*In the case of ammonia, where a state demonstrates that mussels are not present on a site-specific basis, the recalculation procedure may be used to remove the mussel species from the national criteria dataset to better represent the species present at the site.*"

The Central Valley Water Board issued a 3 April 2014 *California Water Code Section 13267 Order for Information: 2013 Final Ammonia Criteria for Protection of Freshwater Aquatic Life* (13267 Order) requiring the Discharger to either participate in an individual or group study to determine the presence of mussels or submit a method of compliance for complying with effluent limitations calculated assuming mussels present using the 2013 Criteria. The Discharger submitted a letter to the Central Valley Water Board indicating their participation in the Central Valley Clean Water Association Freshwater Collaborative Mussel Study. Studies are currently underway to determine how the latest scientific knowledge on the toxicity of ammonia reflected in the 2013 Criteria can be implemented in the Central Valley Region as part of a Basin Planning effort to adopt nutrient and ammonia objectives. Until the Basin Planning process is completed, the Central Valley Water Board will continue to implement the 1999 Criteria to interpret the Basin Plan's narrative toxicity objective.

Because the Sacramento River has a beneficial use of cold freshwater habitat and the presence of salmonids and early fish life stages in the Sacramento River is well-documented, the recommended criteria for waters where salmonids and early life stages are present were used.

The maximum permitted effluent pH is 8.0, as discussed in section IV.C.3.c.xili. In order to protect against the worst-case short-term

[1] *Aquatic Life Ambient Water Quality Criteria for Ammonia – Freshwater*, published August 2013 [EPA 822-R-13-001]

exposure of an organism, a pH value of 8.0 was used to derive the acute criterion. The resulting acute criterion is 5.62 mg/L.

A chronic criterion was calculated for each day when paired temperature data and pH were measured using rolling 30-day average downstream receiving water data for temperature and pH. The temperature of the receiving water varies seasonally. Therefore, seasonal water quality criteria were calculated for the winter season (i.e., 1 November through 31 March) and the summer season (1 April through 31 October). The minimum criterion, or CCC, was established as the applicable 30-day average chronic criterion, or 30-day CCC, for each season. For the summer season, the most stringent 30-day CCC was 2.45 mg/L (as N) and the 4-day average concentration was 6.13 mg/L (as N). For the winter season, the most stringent 30-day CCC was 3.58 mg/L (as N) and the 4-day average concentration was 8.95 mg/L (as N).

(b) **RPA Results.** The Facility is a POTW that treats domestic wastewater. Untreated domestic wastewater contains ammonia in concentrations that is harmful to aquatic life and exceeds the Basin Plan narrative toxicity objective. Reasonable potential therefore exists and effluent limitations are required.

Federal regulations at 40 C.F.R. section 122.44(d)(1)(i) requires that, "*Limitations must control all pollutants or pollutant parameters (either conventional, nonconventional, or toxic pollutants) which the Director determines are or may be discharged at a level which will cause, have the reasonable potential to cause, or contribute to an excursion above any State water quality standard, including State narrative criteria for water quality.*" For priority pollutants, the SIP dictates the procedures for conducting the RPA. Ammonia is not a priority pollutant. Therefore, the Central Valley Water Board is not restricted to one particular RPA method. Due to the site-specific conditions of the discharge, the Central Valley Water Board has used professional judgment in determining the appropriate method for conducting the RPA for this non-priority pollutant constituent.

U.S. EPA's September 2010 NPDES Permit Writer's Manual, page 6-30, states, "*State implementation procedures might allow, or even require, a permit writer to determine reasonable potential through a qualitative assessment process without using available facility-specific effluent monitoring data or when such data are not available…A permitting authority might also determine that WQBEL's are required for specific pollutants for all facilities that exhibit certain operational or discharge characteristics (e.g., WQBEL's for pathogens in all permits for POTW's discharging to contact recreational waters).*" U.S. EPA's TSD also recommends that factors other than effluent data should be considered in the RPA, "*When determining whether or not a discharge causes, has the reasonable potential to cause, or contributes to an excursion of a numeric or narrative water quality criterion for individual toxicants or for toxicity, the regulatory authority can use a variety of factors and information where facility-specific effluent monitoring data are unavailable. These factors also should be considered with available effluent monitoring data.*" With regard to POTW's, U.S. EPA recommends that, "*POTW's should also be*

characterized for the possibility of chlorine and ammonia problems." (TSD, p. 50)

Nitrification is a biological process that converts ammonia to nitrite and nitrite to nitrate. Denitrification is a process that converts nitrate to nitrite or nitric oxide and then to nitrous oxide or nitrogen gas, which is then released to the atmosphere. The Discharger does not currently provide nitrification to remove ammonia from the waste stream. Inadequate or incomplete nitrification may result in the discharge of ammonia to the receiving stream. Ammonia is known to cause toxicity to aquatic organisms in surface waters. Discharges of ammonia in concentrations that produce detrimental physiological responses to human, plant, animal, or aquatic life would violate the Basin Plan narrative toxicity objective. Inadequate or incomplete nitrification creates the potential for ammonia to be discharged and provides the basis for the discharge to have a reasonable potential to cause or contribute to an in-stream excursion above the NAWQC. Therefore, the Central Valley Water Board finds the discharge has reasonable potential for ammonia and WQBEL's are required.

(c) **WQBEL's.** This Order retains the average monthly effluent limitations (AMEL's) of 1.5 mg/L (1 April through 31 October) and 2.4 mg/L (1 November through 31 March) from Order R5-2010-0114-04; however, in accordance with 40 C.F.R. section 122.45(d)(2), average weekly effluent limitations (AWEL's) are included in lieu of maximum daily effluent limitations (MDEL's). AWEL's of 1.7 mg/L (1 April through 31 October) and 3.0 mg/L (1 November through 31 March) were calculated using the existing ECA's and statistical multipliers with a 98th percentile occurrence probability.

(d) **Plant Performance and Attainability.** Analysis of the effluent data shows that the MEC of 43 mg/L is greater than the applicable WQBEL's. The Central Valley Water Board concludes, therefore, that immediate compliance with these effluent limitations is not feasible and appears to put the Discharger in immediate non-compliance with the ammonia final effluent limitations. New or modified control measures may be necessary in order to comply with the effluent limitations, and the new or modified control measures cannot be designed, installed and put into operation within 30 calendar days. The Discharger submitted an infeasibility analysis dated August 2010. As discussed in section IV.E of this Fact Sheet, a compliance schedule has been included in this Order for ammonia.

ii. **Bis (2-Ethylhexyl) Phthalate**

(a) **WQO.** The CTR includes a criterion of 1.8 µg/L for bis (2-ethylhexyl) phthalate for the protection of human health for waters from which both water and organisms are consumed.

(b) **RPA Results.** The MEC for bis (2-ethylhexyl) phthalate was 8.1 µg/L based on 87 grab samples collected between January 2012 and December 2014. The maximum observed upstream receiving water concentration was an estimated concentration of 1.93 µg/L based on 12 samples collected between January 2012 and December 2014. Therefore, bis (2-ethylhexyl) phthalate in the discharge has a reasonable